Ajo MUNICIPAL AIRPORT

Chapter Three

AVIATION FACILITY REQUIREMENTS

Ajo MUNICIPAL AIRPORT

AVIATION FACILITY REQUIREMENTS

To properly plan for the future of Ajo Municipal Airport, it is necessary to translate forecasted aviation use into the specific types and quantities of facilities that can adequately serve this identified demand. This chapter uses the results of the forecasting conducted in Chapter Two and establishes planning criteria to determine the airfield (i.e., runways, taxiways, navigational aids, marking and lighting) and landside (i.e., hangars, terminal building, aircraft parking apron, fueling, automobile parking and access) facility requirements.

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities and outline what and when new facilities may be needed to accommodate forecasted demands. Having established these requirements, alternatives for providing the necessary facilities will be evaluated in Chapter Four to determine the most cost-effective and efficient means for implementation.

Recognizing that the need to develop facilities is determined by demand, rather than a point in time, the requirements for new facilities have been expressed for the short, intermediate, and long term planning horizons, which roughly correlate to five- year, ten-year, and twenty-year time frames. Future facility needs will be related to these activity levels rather than a specific year. **Table 3A** summarizes the activity levels that define the planning horizons used in the remainder of this master plan.

AIRFIELD REQUIREMENTS

Airfield requirements include the needs for those facilities related to the arrival and departure of aircraft. These facilities comprise the following items:

- Runways
- Taxiways
- Navigational Aids
- Airfield Marking and Lighting

TABLE 3A **Planning Horizon Activity Levels**			
	Short Term Planning Horizon	**Intermediate Term Planning Horizon**	**Long Term Planning Horizon**
Based Aircraft	9	11	17
Annual Operations	2,475	3,000	4,675

The following describes the scope of facilities that would be necessary to accommodate the airport's forecasted role throughout the planning period.

AIRFIELD DESIGN STANDARDS

The selection of the appropriate FAA design standards for the development of the airfield facilities is based primarily upon the characteristics of the aircraft that are expected to use the airport. The most critical characteristics are the **approach speed** and **wingspan** of the **critical design aircraft** anticipated to use the airport now and in the future. The critical design aircraft is defined as the most demanding category of aircraft that conducts 500 or more operations per year. Planning for future aircraft use is of particular importance since design standards are used to plan separation distances between facilities. Appropriately locating these airfield facilities now, reduces/eliminates the need to relocate them in the future, which would be an expensive endeavor.

The FAA has established criteria for use in the sizing and design of airfield facilities. These standards include criteria which relate to aircraft size and performance. According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design,* an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at the aircraft's maximum certificated weight. The five approach categories used in airport planning are as follows:

Category A: Speeds of less than 91 knots.

Category B: Speeds of 91 knots or more, but less than 121 knots.

Category C: Speeds of 121 knots or more, but less than 141 knots.

Category D: Speeds of 141 knots or more, but less than 166 knots.

Category E: Speeds of 166 knots or more.

The second basic design criteria relates to aircraft size. The Airplane Design Group **(ADG)** is based upon wingspan. The six groups are as follows:

Group I: Up to but not including 49 feet.

Group II: 49 feet up to but not including 79 feet.

Group III: 79 feet up to but not including 118 feet.

Group IV: 118 feet up to but not including 171 feet.

Group V: 171 feet up to but not including 214 feet.

Group VI: 214 feet or greater.

Together, approach category and ADG identify a coding system whereby airport design criteria are related to the operational and physical characteristics of the aircraft intended to operate at the airport. This code, the **Airport Reference Code** (ARC), has two components: the first, depicted by a letter, is the aircraft approach category; the second, is the airplane design group. Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to separation criteria involving taxiways and taxilanes. **Table 3B** provides a listing of typical aircraft including their Airport Reference Code, approach speed, wingspan, and maximum takeoff weight.

The FAA advises designing airfield elements to meet the requirements of the airport's most demanding or critical aircraft. As previously discussed, this is the aircraft or group of aircraft expected to perform 500 or more operations per year. In order to determine facility requirements, the ARC of the airport should first be determined, then appropriate airport design criteria can be applied.

Presently, the Airport's ARC is B-I, however, based on the forecasts conducted in Chapter Two, Ajo Municipal Airport will most likely have an ARC B-II classification by the conclusion of the planning horizon. As noted in the previous chapter, currently only single engine aircraft are based at the airport. Given the remote location of the airport and the surrounding economic base, most of aircraft using the airport will continue to be of the light, single-engine variety. The future planning forecasts, however, call for increased multi-engine and turboprop activity.

In the coming years, ARC B-II aircraft weighing at or over 12,500 pounds would be the most demanding type of aircraft operating at Ajo Municipal Airport. This classification includes the twin turboprop Beech Super King Air 300, Cessna 441 Conquest and continues on up to the Cessna Citation and Dassault Falcon series of business jet aircraft. These aircraft comprise the majority of active business jet aircraft and are the most cost-effective for corporations to own and operate. Again, although the present ARC B-I is most likely sufficient for the short-term planning horizon, future airside and landside facilities planning should consider FAA design criteria for ARC B-II.

RUNWAYS

The adequacy of the existing runway system has been analyzed from a number of perspectives such as runway length, runway width, and pavement strength. From this information, requirements for runway improvements have been determined for the airport.

Airfield Capacity

A demand/capacity analysis measures the capacity of the airfield facilities (i.e., runways and taxiways) in order to identify and plan for additional development needs. The capacity of the airfield is affected by several factors including airfield layout, meteorological conditions, aircraft mix, runway use, aircraft arrivals, aircraft

TABLE 3B
Representative General Aviation Aircraft by Airport Reference Code

Airport Reference Code	Typical Aircraft	Approach Speed (knots)	Wingspan (feet)	Maximum Takeoff Weight (lbs.)
	Single-Engine Piston			
A-I	Cessna 150	55	32.7	1,600
A-I	Cessna 172	64	35.8	2,300
A-I	Beechcraft Bonanza	75	37.8	3,850
	Multi-Engine Piston			
B-I	Beechcraft Baron 58	96	37.8	5,500
B-I	Piper Navajo	100	40.7	6,200
B-I	Cessna 421	96	41.7	7,450
	Turboprop			
B-I	Mitsubishi MU-2	119	39.2	10,800
B-I	Piper Cheyenne	119	47.7	12,050
B-I	Beechcraft King Air B-100	111	45.8	11,800
	Business Jets			
B-I	Cessna Citation I	108	47.1	11,850
B-I	Falcon 10	104	42.9	18,740
	Turboprop			
B-II	Beechcraft Super King Air	103	54.5	12,500
B-II	Cessna 441	100	49.3	9,925
	Business Jets			
B-II	Cessna Citation II	108	51.7	13,330
B-II	Cessna Citation III	114	53.5	22,000
B-II	Falcon 20	107	53.5	28,660
B-II	Falcon 900	100	63.4	45,500
	Business Jets			
C-I	Learjet 55	128	43.7	21,500
C-I	Rockwell Sabre 75A	137	44.5	23,300
C-I	Learjet 25	137	35.6	15,000
	Turboprop			
C-II	Rockwell 980	121	52.1	10,325
	Business Jets			
C-II	Canadair Challenger	125	61.8	41,250
C-II	Gulfstream III	136	77.8	69,700
	Business Jets			
D-I	Learjet 35	143	39.5	18,300
D-II	Gulfstream II	141	68.8	65,300
D-II	Gulfstream IV	145	78.8	71,780

touch-and-go activity, and exit taxiway locations. An airport's airfield capacity is expressed in terms of its annual service volume. Annual service volume is a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year with limited levels of delay.

According to FAA guidelines detailed in FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, the annual service volume of a single runway configuration comparable to Ajo Municipal Airport normally exceeds 230,000 operations. Since the forecasts for the airport indicate that activity through the planning horizon will remain well below 230,000 annual operations, the capacity of the existing airfield system will not be reached and the existing airfield configuration can meet operational demands. The facility requirements analysis will focus, therefore, on developing those facilities which will improve safety and service concerns rather than demand/capacity needs.

Runway Orientation

Wind conditions are the prime element in determining runway orientation. When prevailing winds are consistently from one direction, runways are generally oriented in that direction. In most areas, however, consistency of wind direction is not found. In these circumstances, a multiple runway configuration may be required. The FAA has established guidelines recommending that an airport's runway system should provide 95 percent usability of the airfield. This 95 percent wind coverage is based upon the crosswind not exceeding 10.5 knots (12 mph) for ARC's A-I and B-I; 13 knots (15 mph) for ARC's A-II and B-II; and 16 knots (18 mph) or ARC's C-I through D-II.

Ajo Municipal Valley Airport is presently served by a single runway, Runway 12-30, which is oriented in a northwest-southeast direction. According to **Exhibit 1F, Comparative Wind Roses** in Chapter One, Runway 12-30, just meets the minimum FAA requirements (95 percent) for wind coverage in the 10.5 knot (12 mph) range and exceeds the 95 percent required coverage for the 13 knots (15 mph) category. However, the limited information used to construct this wind rose is over fifty years old and may not reflect current wind conditions at the Airport. Additionally, present airport users have expressed a need for an operational crosswind runway at Ajo Municipal Airport. Therefore, given the age of the existing wind data and the airport users concerns, it is recommended that a one-year wind study be conducted to assess both the need and orientation of any future crosswind runway.

The remainder of this chapter will proceed under the assumption that the need for a future crosswind runway at the Airport will be confirmed. Again, a crosswind runway would satisfy FAA wind coverage requirements for the smaller aircraft which make up 100 percent of existing users, and provide for safer take-off and landing operations at the Airport. As noted in Chapter One, the Airport originally had three runways; the two dirt runways are presently closed and partially overgrown with desert vegetation. **Table 3C**, compares the resulting wind coverages that would be provided in conjunction with the existing Runway 12-30, should either of the presently closed runways (Runway 18-36 or Runway 5-23) be reactivated. An examination of this table appears to support the reactivation of Runway 5-23 as indicated by its greater combined wind coverage with Runway 12-30.

Runway Length

The determination of runway length requirements for an airport are based upon five primary factors: airport elevation, mean maximum temperature of the hottest month, runway gradient (elevation differences between each runway end), critical aircraft type expected to use the airport, and stage length of the longest nonstop trip destinations. Aircraft performance declines as elevation, temperature, and runway gradient factors increase.

Table 3D outlines the runway length requirements for the various classes of aircraft. Runway 12-30's existing length of 3,800 feet is capable of accommodating 95 percent of small aircraft (12,500 pounds or less) with less than ten passenger seats. This runway length is adequate for the current ARC B-I classification, however, for ARC B-II, a runway length of 4,800 feet is recommended for the short-term planning horizon. This would allow the airport to accommodate small aircraft with ten or more passenger seats. Furthermore, by the end of the long-term planning period a runway length of 5,500 feet is recommended. This length would accommodate 75 percent of large airplanes of 60,000 pounds or less at 60 percent of their useful load. These requirements were derived from the FAA Airport Design computer program (Version 4.2D). As with other design criteria, runway length requirements are based upon the critical aircraft grouping. Both the existing and ultimate runway gradient for Runway 12-30 is less than 0.9 percent.

Table 3C
WIND COVERAGE COMPARISON

	12 MPH (10.5 Knots)	15 MPH (13 Knots)
Runway 12-30	94.90%	96.50%
Runway 12-30	94.90%	96.50%
Runway 18-36	96.50%	97.30%
Combined Coverage	**98.10%**	**98.75%**
Runway 12-30	94.90%	96.50%
Runway 5-23	96.65%	97.05%
Combined Coverage	**99.44%**	**99.85%**

Source: Ajo Army Air Field, Ajo, Arizona; January 1942 to January 1946.

The actual operational length of Runways 5-23 and 18-36 during the Airport's army airfield period is unknown. Unless otherwise determined from updated wind data, Runway 5-23 is the runway recommended for reactivation, and will be designed to ARC B-I standards. The recommended length for Runway 5-23 is 3,800 feet which, according to **Table 3D**, would accommodate 95 percent of small aircraft with less than ten passenger seats. The gradient for Runway 5-23 equals 1.03 percent. It is further recommended that Runway 5-23 be paved when reactivated.

TABLE 3D
Runway Length Requirements

AIRPORT AND RUNWAY DATA	
Airport elevation	1,458 feet
Mean daily maximum temperature of the hottest month	103.2 F
Maximum difference in runway centerline elevation	33 feet
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with approach speeds of less than 30 knots	340 feet
Small airplanes with approach speeds of less than 50 knots	920 feet
Small airplanes with less than 10 passenger seats	
75 percent of these small planes	3,150 feet
95 percent of these small planes	**3,750 feet**
100 percent of these small planes	4,410 feet
Small airplanes with 10 or more passenger seats	**4,780 feet**
Large airplanes of 60,000 pounds or less	
75 percent of these planes at 60 percent useful load	**5,490 feet**
100 percent of these planes at 60 percent useful load	7,100 feet
Airplanes of more than 60,000 pounds	5,520 feet

Source: FAA Airport Design computer program Version 4.2A.

Runway Width

Presently, Runway 12-30 is 60 feet wide, which is the current B-I width requirement. ARC B-II design criteria specifies a runway width of 75 feet. Widening of this runway to 75 feet should be planned once the initial runway length (4,800 feet) is provided.

As discussed earlier, Runway 5-23 is a dirt runway. Its actual width during its operational period is unknown. ARC B-I specifies a width of 60 feet for this runway, regardless of its surface composition. Should Runway 5-23 remain a dirt runway, all brush and other obstacles of significant size must cleared within the runway object free area. The runway object free area for design category ARC B-I is 400 feet wide and extends 240 feet beyond each runway end.

Runway Strength

Runway 12-30 has a published pavement strength rating of 12,000 pounds single-wheel gear loading (SWL). This rating is sufficient in light of current airport usage. However, the larger ARC B-II corporate type aircraft projected to use this runway in the future could weigh up to 30,000 pounds in a dual-wheel gear (DWL) configuration. Therefore, future planning should include strengthening this runway to 30,000 pounds DWL. This upgrade would be incorporated with the recommended runway lengthening and widening discussed previously.

Due to its present dirt composition, an existing runway strength rating for Runway 5-23 cannot be determined. In conjunction with the recommendation to pave this runway, a strength rating of 12,500 pounds SWL is advised. This strength rating should be adequate for the duration of the planning period.

TAXIWAYS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and runways, whereas other taxiways become necessary as activity increases at an airport in order to provide safe and efficient use of the airfield. Three crucial elements involved in taxiway design are: taxiway width, separation distance between runways and parallel taxiways, and pavement strength rating.

Exhibit 1B, in Chapter One illustrates the existing taxiways at Ajo Municipal Airport. Runway 12-30 is served by two exit taxiways, the taxiway running east-to-west at midfield is paved, 40 feet wide, and connects the apron/T-hangar area to the runway's northwest end. To the southeast, a 35-foot wide, dirt taxiway connects the Runway 30 approach end to the southeastern half of the apron/T-hangar area. Each of these taxiways meets the width criteria specified for ARC B-II aircraft. The current pavement strength of the east-west paved taxiway is 12,500 pounds SWL. Like Runway 5-23, the strength rating of the dirt taxiway to the south cannot be determined. Future planning should include paving this taxiway and maintaining its present width. As with Runway 12-30, it is recommended that each of these taxiways be upgraded to 30,000 pounds DWL.

Additional consideration should be given to providing a full-length, parallel taxiway extending from the northwest edge of the aircraft apron and connecting to the Runway 12 approach end. This taxiway would also connect to the Runway 30 end as an apron edge taxiway which would be denoted by pavement markings. Currently, the distance from the Runway 12-30 centerline to the edge of the aircraft parking apron is approximately 495 feet. This distance exceeds the runway centerline to parallel taxiway/taxilane centerline separation requirement of 240 feet specified by ARC B-II. The two existing taxiways previously discussed would be incorporated into this new taxiway configuration. Again, this taxiway should be 35-feet wide and strengthened to 30,000 DWL to fully accommodate ARC B-II aircraft.

To adequately serve Runway 5-23 upon its reactivation, it is advised that the original, partial-length, parallel dirt taxiway to the northeast be reopened. This taxiway previously connected the northeast apron edge to the Runway 5 end. Reopening of this taxiway should include paving to a strength rating of 12,500 pounds SWL and widening to 25 feet. With regard to the southwest portion of this runway, future planning should include construction of a parallel taxiway extending from the Runway 23 end to where it would intersect Runway 12-30 and then connecting to the existing aircraft apron. Similar to the parallel taxiway proposed for Runway 12-30, this taxiway serving the Runway 23 end would be connected to the Runway 5 end by means of an apron edge taxiway, thus providing Runway 5-23 with a full-length parallel taxiway. The width and pavement strength of this new parallel taxiway section would match the northeast parallel taxiway section discussed above.

It is further recommended that holding aprons be provided at or near each runway end. These aprons provide aircraft with an area to conduct final checks prior to takeoff. Aircraft unable to takeoff due to a malfunction can be bypassed here by other aircraft ready for takeoff. Generally, such aprons are designed large enough to accommodate from two to four aircraft, which is dependent on the average size of aircraft utilizing the runway in question.

Additional considerations concerning future taxiway improvements include marking, signage and lighting. These items enhance both the safety and efficient movement of aircraft to and from the runway system. Future planning requirements regarding taxiway marking, lighting and signage are addressed in the section dealing with runway/taxiway marking and lighting which follows later in this chapter.

NAVIGATIONAL AIDS

Electronic navigational aids are used by aircraft during an approach to an airport. Instrument approach procedures are a series of maneuvers designed by the FAA which utilize navigational aids to assist pilots in locating and landing at an airport and are especially helpful during inclement weather conditions. Additionally, pilots often use instrument approaches during good visibility conditions. At present, there are no instrument approaches available at Ajo Municipal Airport. Having no instrument approaches means that the airport is effectively closed during poor weather situations when visual flight can no longer be attempted. The three closest public use airports providing instrument approach capability are Ryan Airfield (87 nautical miles east), Yuma International Airport-MCAS (89 nautical miles west), and Tucson International Airport (99 nautical miles east).

Nationwide, the increased use of general aviation aircraft for business and corporate aircraft has elevated the need for instrument approaches at noncommercial airports. In order to support this growing segment of general aviation plus the fact that Ajo Municipal Airport is virtually the only air access for the surrounding communities, it is vital that the airport be accessible in all weather conditions and that weather-related down time at the airport be reduced. The advent of Global Positioning System (GPS) technology will ultimately provide the capability of establishing instrument approaches at the airport. As noted in Chapter One, the FAA is proceeding with a program to transition from existing, ground-based navigational aids to a satellite-based navigation system utilizing GPS technology.

Currently, GPS is certified for enroute guidance and for use with instrument approach procedures. The initial GPS approaches being developed by the FAA provide only course guidance information. By 1999, it is expected that GPS will also be certified for use in providing descent information for an instrument approach. This capability is currently only available using an Instrument Landing System (ILS). GPS approaches fit into three categories, each based upon the desired visibility minimum of the approach. The three categories of GPS approaches are: one-half mile, three-quarter mile, and one mile. To be eligible for a GPS approach, the airport landing surfaces must meet specific standards as outlined in Appendix 16 of the FAA Airport Design Circular. The specific airport landing surface requirements which must be met in order to establish a GPS approach and a comparison of these standards to existing airport facilities is summarized in **Table 3E**. The *Navigational Aids and Aviation Special Services Study* released in March 1999 by the Aeronautics Division of ADOT recommends and supports the establishment of a one-mile GPS approach to Runway 30 at Ajo Municipal Airport. Facility planning, therefore, will proceed under the assumption that the GPS approach will be approved and implemented within the short term planning horizon.

TABLE 3E
GPS Instrument Approach Requirements

Requirement	One-Half Mile Visibility	3/4-Mile Visibility Greater Than 300-Foot Cloud Ceiling	One-Mile Visibility Greater Than 400-Foot Cloud Ceiling	Runway 12-30 Existing
Minimum Runway Length	4,200 Feet	3,500 Feet	2,400 Feet	3,800 Feet
Runway Markings	Precision	Nonprecision	Visual	Visual
Runway Edge Lighting	Medium Intensity	Medium Intensity	Low Intensity	Low Intensity
Approach Lighting	MALSR	ODALS Recommended	Not Required	None
Primary Surface	500 feet clearance on each side of runway	500 feet clearance on each side of runway	250 feet clearance on each side of runway	125 feet clearance on each side of runways

Source: Appendix 16, FAA AC 150/5300-13, Airport Design, Change 5

MALSR - Medium intensity Approach Lighting System with Runway Alignment Lighting
ODALS - Omni-directional Approach Lighting System

As indicated by the table, the existing Runway 12-30 could support a one mile visibility minimum GPS approach by simply increasing the total width of the existing primary surface from 250 feet to the required minimum of 500 feet. Other than vegetation, here are no obstructions within the required primary surface area which would need to be removed. While the ADOT recommended GPS approach to Runway 30 would be implemented within the short term planning period, long term planning should consider one-mile GPS approaches to all remaining runway ends at the Airport. It should be noted that the establishment of any such future GPS approaches will require coordination with the U.S. Air Force as Ajo Municipal Airport is located within restricted military air space.

LIGHTING AND MARKING

Presently, there are a number of lighting and pavement marking aids serving pilots and aircraft using Ajo Municipal Airport. These lighting and marking aids assist pilots in locating the airport at night and in poor weather conditions as well as facilitate aircraft movement on the ground. The current and future lighting requirements for the airport are summarized below.

Identification Lighting

The airport is equipped with a rotating beacon which assists pilots in locating the airport at night. As noted in Chapter One, the airport beacon at Ajo Municipal Airport is mounted atop the T-hangar unit that is farthest south on the aircraft parking apron. This existing beacon is adequate and should be maintained in the future.

Airfield Lighting

Runway 12-30 is equipped with runway threshold lighting and low intensity runway lighting (LIRL).These existing systems are sufficient and should be maintained throughout the planning period. To allow nighttime use of Runway 5-23, however, it is recommended that both runway threshold lighting and LIRL's be installed on this runway as well. These new lighting systems would be controlled by the existing means (timer and pilot activation) used to control Runway 12-30's runway-related lighting.

Presently, no taxiway lighting is available at Ajo Municipal Airport. To increase the safety and efficiency of aircraft operations at night, facility planning should include the installation of pavement edge lighting along all taxiways, both existing and proposed. Additionally, the installation of apron and aircraft parking area lighting where not currently available would further enhance night operations and improve overall airport security.

Visual Approach Aids

Visual glide slope indicators (VGSI) are a system of lights located at the side of the runway and provide visual descent guidance information to pilots during an approach to the runway. Runway 12-30 is equipped with a type of VSGI known as a visual approach slope indicator, or VASI. VASI's are considered to be somewhat antiquated equipment and which the FAA recommends replacing with the newer, more accurate PAPI or precision approach path indicator system. It is advised that the existing VASI-2 system installed near each end of Runway 12-30 be replaced with PAPI-2s. Similarly, installing

PAPI-2s near the approach ends of Runway 5-23 is also recommended.

Pavement Markings

The visual markings on Runway 12-30 identify runway centerline and designation. The current markings are in excellent condition and should be maintained. Also, after the paving of Runway 5-23 is completed, visual centerline and runway designation markings must be applied. Only the midfield taxiway at the airport is marked with centerline striping and edge marking. All future taxiways should also be marked with both centerline striping and edge marking.

Additional Airside Components

Wind indicating devices provide pilots with information as to ground-level wind conditions, while segmented circles indicate airport traffic patterns. Currently, the airport is equipped with one lighted wind cone, which is located near the approach end of Runway 30, and has no segmented circle. Airport users assert that the existing lighted wind cone is barely visible at night. Airport management is currently in the design process of a more sophisticated type of lighted wind indicator which would be incorporated with a segmented circle which reflects the Airport's traffic patterns. The construction/installation date of this upgraded wind indicating device is unknown at this time.

CONCLUSIONS

Exhibit 3A presents a summary of airfield facility requirements for Ajo Municipal Airport. Short-term planning recommendations for Runway 12-30 include extending the runway to 4,800 feet, widening it to 75 feet, and strengthening to 30,000 pounds DWL. Eventually this runway would be extended to 5,500 feet. These improvements would allow Runway 12-30 to serve the needs of all ARC B-II design category aircraft expected to utilize the airport by the end of the planning horizon. Additionally, a one-mile visibility minimum GPS approach to Runway 30 should be implemented within the short-term planning period. Long-term planning should include one-mile GPS approaches for all remaining runway ends. The existing VASI-2 lighting systems for Runway 12-30 should be replaced with the more modern and accurate PAPI-2 systems. Additional planning considerations, in line with the runway improvements, should include a full-length parallel taxiway, additional exit taxiways, paving and widening of the existing dirt taxiway, and holding aprons located near each end of Runway 12-30. To further enhance safety and efficiency, other taxiway improvements should include marking, lighting and signage where applicable.

Should updated wind data support the need for a crosswind runway, short-term planning should further include the reactivation and paving of Runway 5-23 to 3,800 feet by 60 feet with a pavement strength rating of 12,500 pounds SWL. Included in Runway 5-23's reactivation would be the installation of low intensity runway edge lighting (LIRL), runway threshold lights, visual approach aids (PAPI-2's) and the application of visual approach runway markings. To properly and safely service this runway, construction of a full-length parallel taxiway, two exit/entrance taxiways, and holding aprons along with the necessary lighting, marking, and signage should also be considered at this time.

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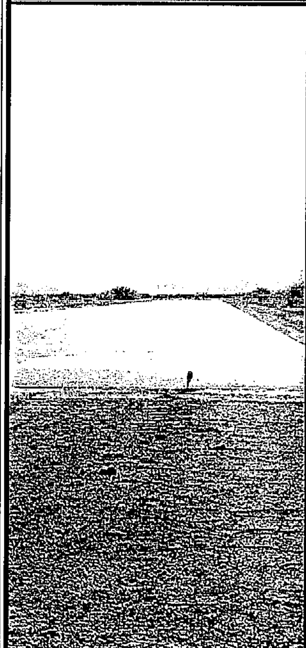
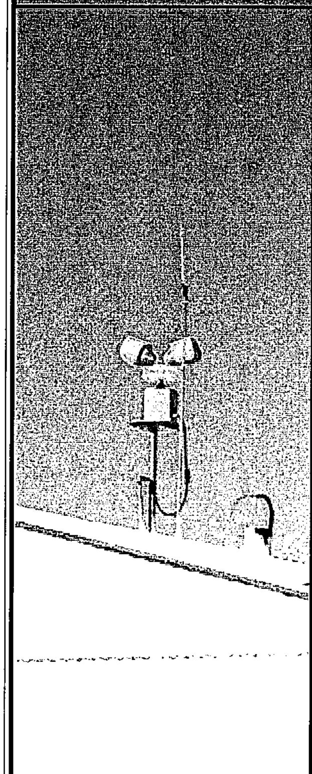
	EXISTING	SHORT TERM NEED	LONG TERM NEED
RUNWAYS AND TAXIWAYS			
	**Runway 12-30** 3800' x 60' 12,000 lbs. SWL Two Entrance/Exit Taxiways (One paved & one dirt)	**Runway 12-30** 4800' x 75' 30,000 lbs. DWL Full-length Parallel Taxiway Three Entrance/Exit Taxiways (All Paved) Holding Aprons **Reactivate Runway 5-23** 3800' x 60' 12,500 lbs. SWL Full-length Parallel Taxiway (Each End) Two Entrance/Exit Taxiways Holding Aprons	**Runway 12-30** 5500' x 75' Same Extend Full-length Parallel Taxiway Additional Exit Taxiways **Runway 5-23** Same Same Same Same Same
NAVIGATIONAL AIDS, AIRFIELD LIGHTING, AND MARKING			
	Rotating Beacon **Runway 12-30** Low Intensity Runway Lighting (LIRL) Runway Threshold Lights VASI-2 Basic Runway Markings (Visual) **Taxiways** Centerline/Edge Marking (On paved taxiway only)	Same **Runway 12-30** Same Same PAPI-2 Same **Runway 5-23** Low Intensity Runway Lighting (LIRL) Runway Threshold Lights PAPI-2 Basic Runway Markings (Visual) **Taxiways** Centerline/Edge Marking Low Intensity Taxiway Lighting (LITL)	Same **Runway 12-30** Same **Runway 5-23** Same **Taxiways** Same

Ajo MUNICIPAL AIRPORT

Exhibit 3A
AIRFIELD REQUIREMENTS

LANDSIDE REQUIREMENTS

Landside facilities are those necessary for handling of aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacities of the various components of each area were examined in relation to projected demand to identify future landside facility needs.

AIRCRAFT STORAGE FACILITIES

The space required for hangar facilities is dependent upon the number and type of aircraft expected to be based at the airport. The percentage of aircraft varies from airport to airport depending upon local climatic conditions, owner preferences and airport security. In Arizona, at airports where hangar facilities are available, demand for hangars ranges from 60 to 80 percent. In 1997, of the four aircraft based at Ajo Municipal Airport, three were hangared. The single remaining aircraft utilized one of the six available open tie-down positions southeast of the T-hangar area. Varied weather conditions at Ajo Municipal Airport, ranging from extreme heat to intense "monsoon" thunderstorms, suggest that the majority of aircraft owners prefer to hangar their aircraft as opposed to tying them down outside. Additionally, given the remote location of the airport, and the absence of around-the-clock attendance or regular security patrols, the increased security offered by hangars is an important factor to be considered by owners basing their aircraft at Ajo Municipal Airport. For planning purposes, it is estimated that the percentage of aircraft hangared will rise from its present 75 percent to 80 percent for single engine aircraft through the planning period. Planning for forecasted, based multi and turbine engine aircraft requiring hangar facilities will be approximately 90 percent of the estimated totals for such aircraft for the entire planning period. As a result, the combined percentage of aircraft hangared at Ajo Municipal Airport will be slightly above 82 percent (14 aircraft) by the end of the planning period.

The type of hangar, either T-Hangar, shade hangar or conventional hangar, was also determined for the airport. Aside from being less expensive to construct than conventional hangars, T-hangars provide aircraft owners with more privacy and allow for easier access to their aircraft. Shade hangars (covered tie-downs) offer limited protection from the weather and are not as secure as enclosed T-hangars. The principal uses of conventional hangars at general aviation airports are for large aircraft storage, aircraft storage during maintenance, and for housing fixed based operator activities.

Since the present number of based aircraft as well as the forecast based and transient aircraft population is insufficient to establish a market for a Fixed Based Operator (FBO), the expense of constructing a large conventional hangar facility cannot be justified. Should a market for a multi-service FBO develop during the planning period, however, a site for such a conventional hangar facility should be identified within the long-term planning horizon.

Due to both climatic conditions and airport security limitations, new aircraft storage facilities should consist of T-hangars and not shade hangars. Of the forecast based aircraft requiring storage facilities, the majority will utilize T-hangars, however, four of the other types of forecast aircraft (multi-engine, turboprop, helicopter, etc.) could be large enough to warrant the eventual construction of a conventional or corporate hangar storage facility; therefore, an area should be designated for a possible corporate hangar location. **Table 3G** estimates future hangar requirements for the airport. A planning standard of 1,200 square feet per based aircraft stored in T-hangars has been used to determine future T-hangar requirements. For a future conventional hangar facility, a planning standard of 2,500 square feet per based aircraft has been used. Additionally, the requirements for conventional hangar area was increased by 15 percent to account for future aircraft maintenance needs.

AIRCRAFT PARKING APRONS

A parking apron should be provided for at least the number of locally-based aircraft that are not stored in hangars, as well as transient aircraft. Currently, there are 6 designated tie-down spaces available on the aircraft parking apron located south of the T-hangar area. This apron is used by single and twin-engine GA aircraft, and is not presently divided into local and transient parking positions. Presently, there is no fee to park in these tie-down spots.

As noted in Chapter One, there is more than 85,000 square yards of parking apron available at Ajo Municipal Airport. This large apron area is a remnant of the airfield's military days and is in need of both repairs and preventative maintenance. According to ADOT records, only 23,880 square yards of this apron, due to deterioration and neglect, is currently suitable for aircraft use.

In the future, it is assumed that the majority of based aircraft will be stored in an enclosed hangar, although a certain number of based aircraft will still tie-down outside. To determine future total apron area requirements, a planning criterion of 700 square yards per aircraft parking position was used for both local and transient aircraft.

TABLE 3G
Aircraft Storage Hangar Requirements

			Future Requirements		
	Currently Available	Current Requirements	Short Term	Intermediate Term	Long Term
Aircraft to be Hangared		3	6	8	14
T-Hangar/Shade Hangar Units or Positions	8[1]	3	5	7	10
Conventional Hangar Positions	0	0	1	1	4
T-Hangar Area (s.f.)	9,100	3,600	6,000	8,400	12,000
Conventional Hangar Area (s.f.)	0	0	2,875	2,875	11,500
Total Hangar Area (s.f.)	9,100	3,600	8,875	11,275	23,500

[1] Currently, three (3) T-Hangar positions are occupied by Ajo Airservice and are not used to store aircraft.

Future apron requirements with regard to the total number of tie-down positions and total apron area is presented in **Table 3H**. The 4,200 square yards shown in the table for the total apron area represents only the required area per current needs, which is six tie-downs, and not the 23,880 square yards of usable apron available.

TABLE 3H
Apron Requirements

		Future Requirements		
	Currently Available	**Short Term**	**Intermediate Term**	**Long Term**
Total Combined Local and Transient Tie-down Positions	6	3	4	8
Total Combined Local and Transient Aircraft Parking (Tie-downs) Apron Area (s.y.)	4,200	2,100	2,800	5,600

GENERAL AVIATION TERMINAL FACILITIES

General aviation terminal facilities serve several functions at an airport. This includes providing passenger waiting areas, a pilot's lounge and flight planning area, restrooms, food and beverage concessions, administrative and management offices, storage plus various other needs. At present, there is not a dedicated airport terminal facility at Ajo Municipal Airport, and the one FBO facility located at the airport provides none of the above mentioned functions.

The methodology used in estimating general aviation terminal facility needs are based on the number of airport users expected to utilize general aviation facilities during the design hour. Future space requirements were then based upon providing 75 square feet per design hour itinerant passenger. **Table 3J** outlines these future requirements for general aviation terminal services at Ajo Municipal Airport throughout the planning period. This space is not necessarily limited to a single building and can be provided by the airport sponsor or an FBO facility. The planning process should include siting of a future terminal facility area, in order to ensure that an adequate facility is available.

AVIATION SUPPORT FACILITIES

Certain facilities that do not logically fall under classifications of airfield, terminal building, or general aviation have been identified for inclusion within this Master Plan. Facility requirements, where applicable, have been identified for the following facilities:

- Airport Access
- Vehicle Parking
- Fuel Storage
- Aircraft Wash Rack
- Public Utilities
- Other Facilities

AIRPORT ACCESS

Ajo Municipal Airport is located six miles north of Ajo and approximately one mile east of State Highway (SH) 85. The main access to the airport is from the Meade Road intersection with SH 85, about 1/4 mile northwest of the airport. Running east, Meade Road parallels the northern airport boundary then turns southeast running parallel to the Tucson Cornelia and Gila Bend Railroad line to where it turns south to its intersection with Ajo Airport Road. From this intersection, landside airport access is approximately 4/10 of a mile to the west. The total mileage from SH 85 to the Airport is approximately 2.3 miles. Although this road is adequate for current and future access from SH 85, an alternative access road alignment located entirely within the airport boundary will be examined in the following chapter. Such a road alignment would give the Airport greater control over airport property access and thus lessen or eliminate problems affecting airfield safety and security. The only other recommendation would be for improved signage, that is visible from the highway, indicating the Airport's presence.

Additional access from the east and south is provided by Meade Road as it continues east from its intersection with Ajo Airport Road another 7/10 of a mile to the intersection with Well Road No. 1. This intersection is about ½ mile southwest of the small community of Childs. From this intersection, traveling southwest on Well Road No. 1 to Ajo is a little more than 4 miles. This road provides adequate southerly access to and from the Town of Ajo and the Airport.

A third point of access to the airport, though not marked or official, is provided by the service road that is located approximately 1,320 feet from the end of Runway 30. It should be noted that this road also serves the neighboring Ajo Country Club. Nearly 1.3 miles long, the road begins on the west edge of the Country Club then skirts the southeast edge of the aircraft apron before crossing the extended runway centerline within the Runway Protection Zone (RPZ), turns southwest and, paralleling the four-foot high diversion levee, continues west to SH 85. This intersection with the highway is merely a gap in the Airport's perimeter fence spanned by a cattle guard grate. Local residents use this road as a shortcut to and from SH 85, and in so doing, sometimes drive across the aircraft parking apron. To increase airport security and safety, future planning should consider closing this road to local resident traffic. This could be accomplished by gating the entrance/exit at SH 85 as well as fencing and gating the road where it enters/exits both the Airport and the Country Club. Such security fencing would still allow this service road to be used by Airport and Country Club personnel. To supplant the shortcut function of this semi-public road, Chapter Four will examine the possibility of constructing a new airport access road south of the diversion levee and completely within Airport property that still provides highway access to local residents. It is further recommended that any additional gaps or lack in airport perimeter fencing elsewhere on airport property be addressed, when and where practical, to enhance airport safety and security. At the time of this publication, according to airport management, fencing improvements were being considered in conjunction with future road (Airport Road) and taxiway (Taxiway A2) paving projects.

TABLE 3J
Terminal Requirements

			Future Requirements		
	Currently Available	Current Requirement	Short Term	Intermediate Term	Long Term
Design Hour Passengers		2	2	2	4
Building Space (s.f.)	0	150	150	150	300

VEHICLE PARKING

As noted in Chapter One, there is no designated automobile parking lot at Ajo Municipal Airport. Currently, users of the Airport park in the immediate apron area east and south of the two T-hangar units, with apron access available to based aircraft owners. While adequate for current use, a designated paved and marked parking area will be required in the future to accommodate increased general aviation activity.

Automobile parking requirements for future terminal area activities have been determined using a planning standard of 1.3 spaces per design hour passenger and 400 square feet for each parking position. Additionally, general aviation parking requirements are calculated under the assumption that 20 percent of the based aircraft will require automobile parking at any one time. The parking area required per space is the same that is used in terminal area activities parking requirements. **Table 3K** defines vehicle parking requirements for Ajo Municipal Airport.

FUEL STORAGE

Fuel storage and fueling capability is not presently available at Ajo Municipal Airport. Usually, fuel at airports is stored in underground tanks; however, in recent years this practice has undergone a great deal of scrutiny due to the potential for fuel leaks that can lead to the contamination of both soil and groundwater. Consequently, the design, installation and monitoring requirements from both State and Federal agencies relating to underground fuel storage have increased significantly.

At most airports, fuel storage requirements can vary based upon individual supplies and distributor policies. The recommended fuel storage tank capacity at Ajo Municipal Airport is 12,000 gallons. This size recognizes that capacity of the average fuel delivery truck is 8,000 gallons and given Ajo Municipal Airport's remote location, this amount of storage capacity makes delivery more economically feasible to the delivering fuel supplier. The type of fuel available, such as

TABLE 3K Vehicle Parking Requirements	Currently Available	Current Requirement	Short Term	Intermediate Term	Long Term
Design Hour Passengers		2	2	2	4
Terminal Vehicle Spaces		3	3	3	5
Parking Area (s.f.)		1,200	1,200	1,200	2,000
General Aviation Spaces		1	2	2	3
Parking Area (s.f.)		400	800	800	1,200
Total Airport Parking Spaces	N/A	4	5	5	8
Total Airport Parking Area (s.f.)	N/A	1,600	2,000	2,000	3,200

100LL or both 100LL and Jet-A, is dependent upon the types of aircraft that would most likely utilize such facilities. The availability of fuel at an airport makes it more attractive and usable to both based aircraft owners and itinerant pilots.

The location of the fuel storage area depends upon an airport's operational activity and management procedures. Remote location of the fuel storage facility requires the use of a servicing vehicle to make fuel available to the aircraft. A self service fuel "island", where the pilot can taxi up to the fuel storage area and self-fuel the aircraft, has worked well at other rural airports where no FBO fuel service is available. While current airport usage may not justify the construction of a fuel storage facility in the near term, the designation of a site during the planning process is easier than adjusting to existing conditions in the future. Again, Chapter Four will investigate preferred locations for such a fuel facility.

RECREATIONAL AREA

A 1990 State-funded study explored the feasibility of establishing "fly-in" campgrounds at selected Arizona airports. At the time, the study concluded that 18 sites could potentially accommodate a campground. ADOT subsequently appropriated money for the development of these campgrounds. The first of these sites, a demonstration project, was built at Payson Airport in northern Gila County, and was completed in June 1997. Both the Arizona Department of Transportation - Aeronautics Division and the Arizona Pilot's Association have expressed an interest in establishing a "fly-in" campground at Ajo Municipal Airport. Location options for the development of such a recreational area at the Airport will be examined in the next chapter.

AIRCRAFT WASH RACK

Presently, there is no designated aircraft wash rack facility at Ajo Municipal Airport. Any such future facility should be large enough to accommodate Aircraft Design Group 1 aircraft (49 foot wingspan). Additionally, an enclosed or covered structure should include a 20 foot tail height clearance. The location of the aircraft wash rack should be convenient to both aircraft storage and maintenance hangars as well as the aircraft parking aprons. Furthermore, this facility should comply with applicable waste water recovery/disposal procedures.

PUBLIC UTILITIES

As detailed in Chapter 1, currently, basic utilities are lacking at Ajo Municipal Airport. Other than electric service and phone service, no other utilities are available at the Airport. Future long-term airport development is dependent on absent services such as water, sanitary sewer, and solid waste pickup/disposal being provided.

Water service hookup whether obtained from the Ajo Country Club, which was identified in Chapter One as the closest possible water source, or another available source, such as a well, is vital to airport expansion. On-airport uses for water service include potable water, restrooms and fire suppression. It is recommended that future planning include provision for both a viable water supply and the related water distribution system.

Sanitary sewer service in the form of a septic system should be planned for and implemented in conjunction with the above recommended water utility improvements. The size and location of such a system or systems with regard to future airport development will be addressed in Chapter Four.

The lack of solid waste pickup and disposal at Ajo Municipal Airport could be solved by contracting with the local service provider to place a dumpster at the Airport. Currently, the neighboring Ajo Country Club receives weekly solid waste collection service; therefore, service to the airport could be coordinated with this existing collection schedule.

As noted in Chapter One, electricity is supplied by Arizona Public Service (APS) and the Ajo Improvement Company, Inc. Currently, this service is adequate and should remain so throughout the planning period.

All utilities, with regard to their capacity or limitation, necessary for the forecast development and efficient operation of Ajo Municipal Airport will be considered when determining future airport master plan design alternatives.

OTHER FACILITIES

Since it has no scheduled airline flights, Ajo Municipal Airport is exempt from Federal Aviation Regulation (FAR) Part 139 Standards and is not required to have airport rescue and firefighting equipment on site.

Any new building construction at the airport, whether hangars or conventional structures must conform to applicable sections of the National Fire Protection Association (NFPA) code, the Uniform Fire Code and the Uniform Building Code, and is subject to inspection and approval of the State Fire Marshall's office. Certain hangar activities, such as aircraft repair and maintenance, may require the implementation of a fire suppression system at Ajo Municipal Airport. The requirements for hangars used solely for aircraft storage are less stringent than those used for aircraft repairs and maintenance. A deeper analysis as to current and future hangar activities may be required in order to conform to the above-mentioned codes. Any future fire suppression system should be designed to serve both existing and proposed buildings. Components of such systems may include storage tanks, piping, and/or a booster pump station. The exact design of such a system is dependent on the Airport's future water supply source.

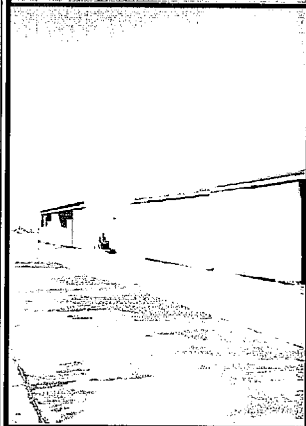
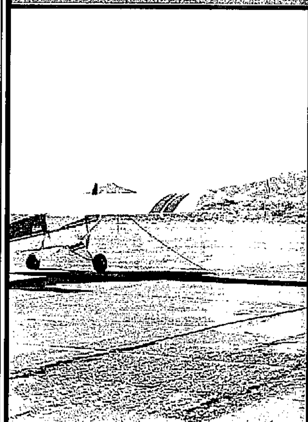
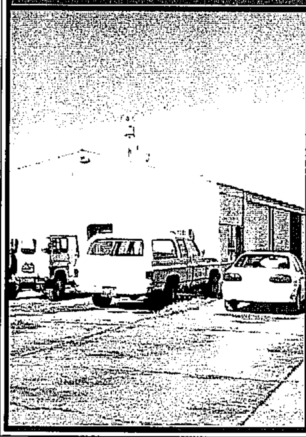
CONCLUSIONS

Landside facility requirements are summarized on **Exhibit 3B.** In order to meet future forecast demand, an increase in available T-hangar space plus the development of conventional hangar space will be required through the planning period. Additionally, a nominal increase in the present number of tie-downs and available apron area for single and twin-engine aircraft is also required. Minimal general aviation terminal facilities currently lacking, such as restrooms, waiting areas, maintenance/storage areas, etc., must be considered in the short term planning period to increase the functionality as well as the development of the airport. Additional long term planning considerations include a general aviation terminal facility. The construction of a new airport access road along with improved airport security in the form of full airport perimeter fencing combined with restricted access gating must also be considered if the airport wishes to attract more based aircraft owners as well as business and corporate flyers. Furthermore, future security fencing considerations should provide for wildlife exclusion. Paved vehicle parking convenient to the T-Hangar and aircraft parking area will be needed throughout the planning period. The establishment of utilities and/or improvements to existing utilities essential to future development is needed. Other upgrades to be considered include the siting of a future corporate parcels lease area, a fuel storage facility, a "fly-in" campground/recreation area, an aircraft wash rack facility, and improved airport location signage.

SUMMARY

The purpose of this chapter has been to identify the facilities required to meet potential aviation demands projected for Ajo Municipal Airport through the planning horizon. The next step is to develop and analyze alternatives that can meet these projected needs. The following chapter will provide this analysis and recommend the best alternative for future development of the Airport.

96MP10-3B-9/8/98

		EXISTING	SHORT TERM NEED	LONG TERM NEED
[illegible]RAGE HANGARS				
	T-Hangar Positions	8	5	10
	Conventional Hangar Positions	--	1	4
	T-Hangar Area (s.f.)	9,100	6,000	12,000
	Conventional Hangar Area (s.f.)	--	2,875	11,500
	Total Hangar Area (s.f.)	9,100	8,875	23,500
APRON AREA				
	Total Local/Transient Aircraft Positions	6	3	8
	Total Apron Area (s.y.)	4,200	2,100	5,600
TERMINAL FACILITIES				
	Building Space (s.f.)	--	150	300 (1,600 [1])
	Terminal Vehicle Spaces	--	3	5 --
	General Aviation Spaces	--	2	3 --
	Total Parking Spaces	N/A	5	8 (18 [2])
	Total Parking Area (s.f.)	N/A	2,000	3,200 (7,200 [2])

[1] NOTE: Total square footage required for Terminal/Restuarant facility.
[2] NOTE: Total required for Terminal/Restuarant facility.

Ajo MUNICIPAL AIRPORT

Exhibit 3B
LANDSIDE REQUIREMENTS